

**QUARTERLY REPORT**GTI PROJECT NUMBER 21078

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**Landfill and Wastewater Treatment RNG  
Chemical and Physical Profiling:  
Increasing the Database Set****DOT Prj# 351****Contract Number: DTPH56-10-T-000006****Reporting Period:**1<sup>st</sup> Project Quarter**Report Issued (Period Ending):**

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## Table of Contents

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	Page
Legal Notice.....	ii
Table of Contents.....	iii
Project Objective.....	4
Activities/Deliverables Completed this Quarter.....	5
Technical Status .....	5

## Project Objective

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The objective of this project is to continue the development of a draft guidance document for the safe introduction of renewable gas into natural gas pipelines. This project will build upon previous studies executed by GTI to further characterize and understand the chemical and biological composition of fully upgraded renewable gas. Gas samples (with an emphasis on post-clean up) will be collected from landfills and waste water treatment facilities and subjected to quantitative analytical chemical and biological tests to measure the concentration of target species. The focus is on samples from facilities currently producing high BTU renewable gas. The two criteria for target species are that they (1) are likely to be in the product gas and (2) have potential to impact pipeline integrity or end use applications. The analytical results obtained from the testing program will be combined with past data and used to report most probable concentrations for those constituents found to be present in renewable gas. The results of this study are not intended to endorse any specific clean up technologies or create national standards for concentration limits for constituents of concern.

## Activities/Deliverables Completed this Quarter

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The following activities began this quarter.

### Task 1 – Laboratory Testing and Analysis of Biogas/RNG

- Select candidate landfills and wastewater treatment plant (WWTP) facilities.
- Finalize list of analytes using information gleaned from previous projects.
- Collect processed biomethane samples from the selected landfills and wastewater treatment facilities.
- Analyze the collected samples in the laboratory for the finalized list of constituents.
- Summarize the results of the comparative analysis.

Activities on the remaining project tasks are dependent upon the results from Task 1 and will begin immediately upon completion of Task 1. The final Task 1 Report is due on Nov. 30 2011.

## Technical Status

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This project's focus is on the sampling and analysis of processed biogas in order to validate the introduction of landfill- and WWTP-derived renewable gas into natural gas pipelines. Considerable background work was completed in a separate project to determine the three most relevant gas cleanup technologies. The three selected processes are:

- Physical Solvent
- PSA (pressure swing adsorption)
- Gas Separation Membrane

While the gas cleanup technologies are divided into the three categories based on their CO<sub>2</sub> removal technology, these systems utilize multiple unit operations designed to remove other components such as oxygen and water. These add-on units are located either upstream or downstream from the main cleanup system. The specific gas cleanup system will be documented for each site sampled.

Representatives from the High-BTU group at the Solid Waste Association of North America (SWANA) assisted in obtaining access agreements with candidate landfills. The sites vary across the continental United States. To date six landfill access agreements have been granted. GTI is separately contacting four WWTP facilities with access agreements still under negotiation. The names of the facilities are being kept confidential, as per the agreements with the landfill/wastewater treatment operators.

The list of constituents to be analyzed in this project was divided into two categories, those with specific natural gas tariff limits, and those constituents that are known to be present in processed biomethane, or are of interest, due to potential breakthrough because of their presence in untreated biogas. The finalized list of constituents to be analyzed in this project is described as follows.

- Analytes with Known Natural Gas Tariff Limits
  - Major hydrocarbons (C<sub>1</sub>-C<sub>6</sub>)
  - Major and Minor Non-Hydrocarbons
    - Carbon dioxide, nitrogen, oxygen, etc.
  - Sulfur Compounds

- H<sub>2</sub>S, odorants, and other naturally occurring organic sulfur compounds
- Mercury
- Analytes Known to be Present or are of Interest
  - Halocarbons
  - Volatile organics
    - BTEX, and certain aldehydes, ketones, VOCs and SVOCs
  - Siloxanes
  - Other elements
    - Metals and other elements such as As, Bi, and Sb.
  - Ammonia
  - Bacteria related to Microbial Induced Corrosion (MIC)

Samples have been collected from four different landfills over the first quarter. The analytical data has been completed for the first landfill. The remaining landfills samples were collected in mid-December and the analytical testing is scheduled to be finished in January.

The sampling efforts were extensive and samples were acquired as per the QAP and standard sampling protocols set forth in a previous DOT project (DTPH56-08-T-000018, "Pipeline Quality Biogas: Guidance Document for Dairy Waste, Wastewater Treatment Sludge and Landfill Conversion" - WPS #348). Trained personnel collected samples using identical sample collection equipment and sampling conditions. Samples were shipped back to GTI within all approved holding time allotments. Samples were collected in triplicate to allow for statistical comparisons and conclusions to be drawn from the data. They were analyzed promptly, using approved and reported methods, within specified hold times.

The complete database of analytical results will be reported with the final Task 1 report.